LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA17 | Offchurch and Cubbington

Survey reports (CH-004-017)

Cultural heritage

November 2013

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Appendix CH-004-017

Environmental topic:	Cultural heritage	CH
Appendix name:	Survey report	004
Community forum area:	Offcurch and Cubbington	017

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1 Introduction

1.1 Structure of the cultural heritage appendices

1.1.1 The cultural heritage appendices for the Offchurch and Cubbington CFA (CFA17) comprise:

- Appendix CH-001-021 – Baseline report;
- Appendix CH-002-021 – Gazetteer of heritage assets;
- Appendix CH-003-021 – Impact assessment table; and
- Appendix CH-004-021 – Survey reports (this appendix).

1.1.2 Maps referred to throughout the cultural heritage appendices are contained in the Volume 5 cultural heritage map book.

1.2 Surveys undertaken

1.2.1 This appendix contains the results of extensive archaeological surveys undertaken. Key surveys reported in this appendix include:

- LiDAR survey of the majority of the land required, temporarily and permanently, to construct the Proposed Scheme plus 500m; and
- hyperspectral survey of the majority of the land required, temporarily and permanently, to construct the Proposed Scheme plus 500m.

1.2.2 The results of aerial photographic analysis have been incorporated into the baseline report in Appendix CH-001-017 and are not reported separately for this CFA.

2 LiDAR and Hyperspectral survey report

2.1 Introduction

2.1.1 The Offchurch and Cubbington CFA extends from Bascote Heath in the south to Cubbington in the north and comprises a largely rural landscape, stretching for some 7.3km on a broadly northwest to southeast alignment.

2.2 Methodology and limitations of analysis

LiDAR data

2.2.1 The filtered LiDAR data was used to create a Digital Terrain Model (DTM), and analysed in the GIS as three rasters comprising elevation data, a hillshade map and a slope map. Similarly, the unfiltered LiDAR data was used to create a Digital Surface Model (DSM) also analysed as elevation data, a hillshade map and a slope map.

2.2.2 Both the DTM and DSM were viewed as rasters in an ARCView GIS project. All identified features were digitised in the GIS from these rasters.

Hyperspectral data

2.2.3 The hyperspectral data was supplied as a series of ENVI DAT raster files, divided into 22 different sections (runs) covering the area of interest (CFA16 to CFA22). Each ENVI DAT contained 34 bands, representing a portion of the electromagnetic spectrum which included visible light and the near-infrared range. The data had a horizontal cell resolution of 1m.

2.2.4 A number of ArcGIS 10's out-of-the-box tools were used to extract, process and analyse the data. Initially, the ENVI DAT files were imported into a mosaic dataset stored within an ArcGIS 10 file geodatabase. A single combined raster dataset, containing the 34 bands, was created from the mosaic dataset.

2.2.5 As no more than three bands can be viewed at once using ArcMap (the red, green and blue bands of the raster dataset) there is a requirement to investigate subsets of the hyperspectral dataset. Particular attention was paid to the near-infrared and the visible red parts of the electromagnetic spectrum, due to the recognised potential of these in helping to highlight archaeological features (Parcak 2009, 101-2). The near-infrared range (760nm to 900nm on the electromagnetic spectrum) covered bands 6 to 13 in the hyperspectral dataset. The visible red range (605nm to 690nm on the electromagnetic spectrum) covered bands 18 to 22 in the hyperspectral dataset.

2.2.6 The near-infrared and visible red bands were extracted from the combined raster dataset, allowing for these bands to be viewed in isolation. Principal Component Analysis was also carried out on these bands using ArcGIS 10's Principal Components tool. The extracted bands were used to generate a series of single output raster datasets for both the near near-infrared and visible red hyperspectral data; this included a single principal component layer dataset and a multiple principal component layer dataset for both ranges. Different principal component layers could then be assigned to the red, green and blue bands of the multiple principal component layers raster datasets.

Digitising

2.2.7 All feature identification was undertaken manually and compared to the results of available aerial photograph evidence. Both hyperspectral and LiDAR plots were examined in detail and features and areas of likely archaeological potential were digitised manually using ArcGIS 10. These features can be seen in Table 1 below. Archaeological features have been assigned a unique WA number, and are briefly described. Where possible broad dates have been suggested based on the form of the features, and the identification of the features has been assigned a confidence rating (based on a simple five point scale (Low, Low to Moderate, Moderate, Moderate to High and High). Where possible, similar features with a common distribution (e.g. former field boundaries or ponds within a coherent area) have been grouped together.

Limitations

2.2.8 The LiDAR data used in the study if this Community Forum Area was largely confined to the land required, temporarily and permanently, to construct the Proposed Scheme, with very little coverage of the 500m study area. As a result of this the majority of the sites identified by LiDAR lie within the land required, temporarily and permanently, to construct the Proposed Scheme. It should also be added that there were some areas where the LiDAR data provided did not extend across the entire area of the land required, temporarily and permanently, to construct the Proposed Scheme, notably two small areas – one close to Burley Stud Farm at the southern end of the area and one just to the northeast of Manor Farm, Offchurch.

2.2.9 Much of this stretch of the route is rural, and given over to farmland. Unfortunately, one result of this is that the DSM was less useful than expected as an interpretative tool, as the LiDAR seems to have been flown whilst the crops were fairly well developed. The main result of this is that these crops mask the underlying terrain on the DSM, reducing its effectiveness as an interpretative tool.

2.2.10 The DTM provides a model of the underlying terrain, stripping away crops and trees. As such it was particularly useful in allowing analysis of areas under crops, trees or woodland. However, even on the DTM, in some areas, low lying ground crops or piles or other obstructions have limited the effectiveness of the LiDAR, with the result that, in a few cases, the ground modelling is far from clear.

2.2.11 The horizontal cell resolution of the data also restricted the identification of smaller features (1m intervals) is also likely to have influenced the visibility of small archaeological features and lessened the clarity of some of the larger features.

2.2.12 The effectiveness of hyperspectral data in identifying archaeology can be significantly influenced by a number of factors, including the nature of the underlying geology, the water content of the ground and the type of ground cover. Significant areas of the route studied lie within dense woodland, where there is no likelihood of features being recognised through analysis of hyperspectral data, or beneath cereal crops, where the identification of features is likely to vary. It also suffers from the same limitations as the LiDAR data in built up areas. Because of these variations, other techniques used for identifying areas of archaeological potential (notably the Normalised Vegetation Data Index (NVDI) and the Water Band Index) were not examined in detail.

2.2.13 The Hyperspectral data supplied covered virtually all of the land required, temporarily and permanently, to construct the Proposed Scheme. The overall coverage provided by the

Hyperspectral data is therefore excellent, although because of the number of variables affecting the visibility of features and the limitations in the bandwidth recovered, it should be noted that the features already identified are likely to represent only a portion of those within the CFA.

2.2.14 Despite these limitations, it is considered that the available LiDAR and Hyperspectral data provides comprehensive coverage of the land required, temporarily and permanently, to construct the Proposed Scheme as well as providing evidence for parts of the surrounding 500m study area.

2.3 Results

2.3.1 A total of twenty five sites were identified on the LiDAR plots within Community Forum Area 17. The bulk of these were identified on the LiDAR plots, with a smaller number also visible on the Hyperspectral imagery. Many appear on both. These are listed in Table 1 below.

2.3.2 This stretch of the route has a good diversity of archaeological remains. Whilst the majority, as might be expected in a rural area, relate to medieval, post medieval and modern farming of the area, the presence of a Roman road and modern canals and railway lines provide a degree of historical depth to what is essentially a medieval and post-medieval landscape.

2.3.3 The Fosse Way, a key element of the Roman road network in Britain, crosses the route within this Community Forum Area (WA17.9, see Figure 1). The Fosse Way linked the key Legionary fortresses at Exeter and Lincoln and probably, in the early post-Conquest years, marked the *de facto* frontier. Major Roman roads such as the Fosse Way became the focus for settlement in the Roman period, and also acted as key routes in the post-Roman period.

2.3.4 As might be expected with a largely rural landscape, the majority of the archaeological sites identified comprise the remains of field boundaries, ponds, hollows (likely to either be infilled ponds or quarries) along with some areas of remnant 'ridge and furrow' agriculture. The latter developed through the ploughing regimes of the medieval and early post medieval periods, and can provide key evidence of the location and extent of medieval open field systems. Well preserved areas of ride and furrow were recorded east of Lower Grange (WA17.14) and East of Cubbington (WA17.18, see Figure 4).

2.3.5 There is some evidence within this Community Forum Area for the growing industrialisation of the area in the late post-medieval and modern periods. In particular the route is crossed by the Grand Union Canal (WA17.1 see Figure 3), which was a key element in the successful early industrialisation of the area, as well as a disused railway line (WA17.10).

2.4 Summary

2.4.1 The landscape within this area is largely a medieval and post-medieval creation, and this is reflected in the features identified, which are dominated by former field systems, including extensive areas of ridge and furrow, some later incorporated within woodland, former field boundaries and quarries/ponds, all likely to be linked to post-medieval and modern agriculture. There is also the later industrialisation of the area and the importance of transport links established, with the Grand Union Canal and a disused railway line both crossing the route within this area. The Roman Fosse Way, which also crosses the route, provides evidence for earlier activity within the area, and is likely to have been a focus for Roman and post-Roman activity and settlement.

2.5 References

Parcak, S, H,. 2009. Satellite Remote Sensing for Archaeology. Routledge, Abingdon.

2.6 Figures

Figure 1: Site WA17.9. Fosse Way Roman Road (pink) on LiDAR plot

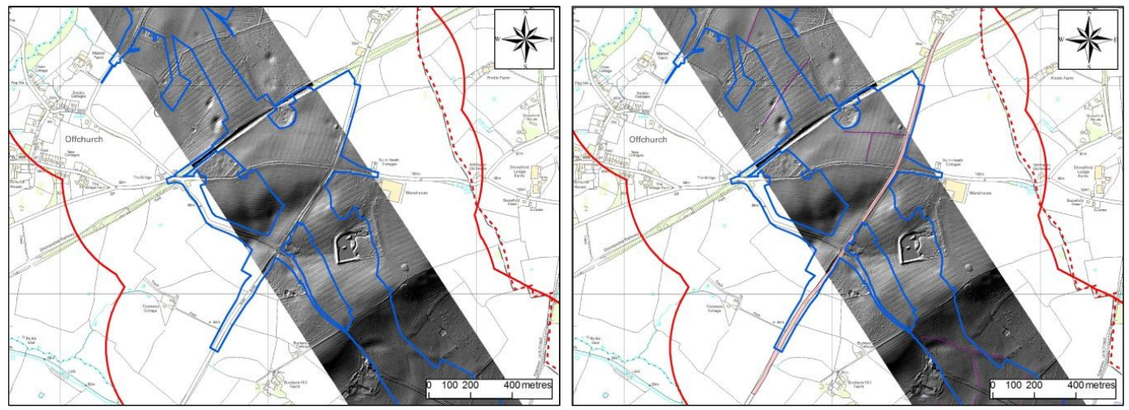

Figure 2: Site 17.19 (blue). Probable 'ridge and furrow' in South Cubbington Wood to the east of Cubbington on LiDAR plot.

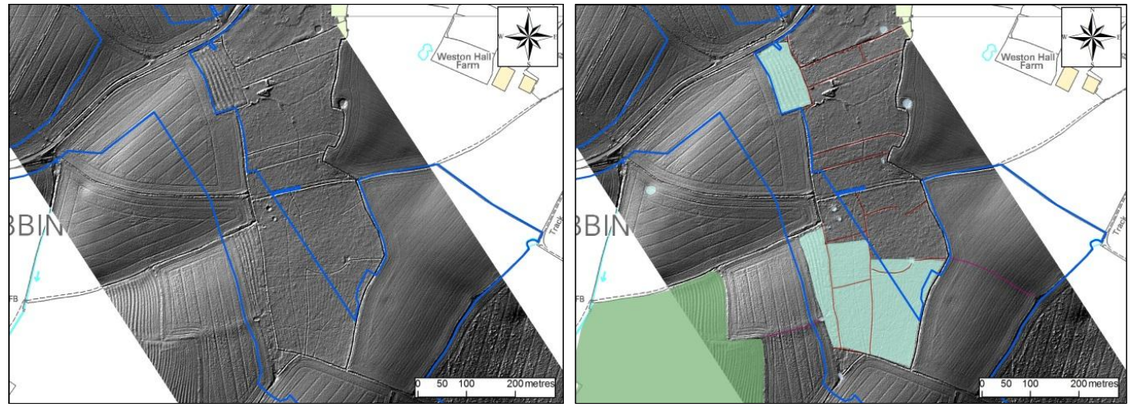

Figure 3: Site WA17.1. Grand Union Canal (pink) on LiDAR plot.

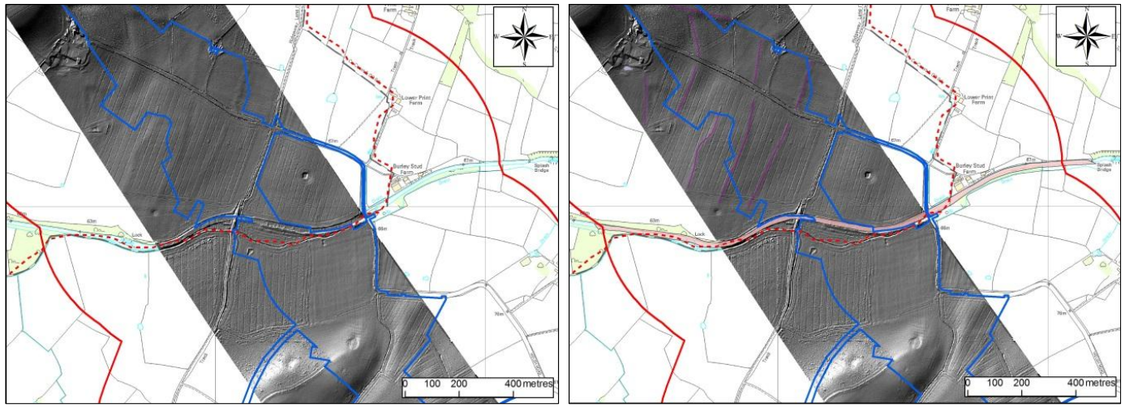

Figure 4: Site WA17.18. Traces of ridge and furrow (green) to the East of Cubbington (Hyperspectral Band 7 – Wavelength 882.725nm).

Figure 5: Anomalies within CFA17

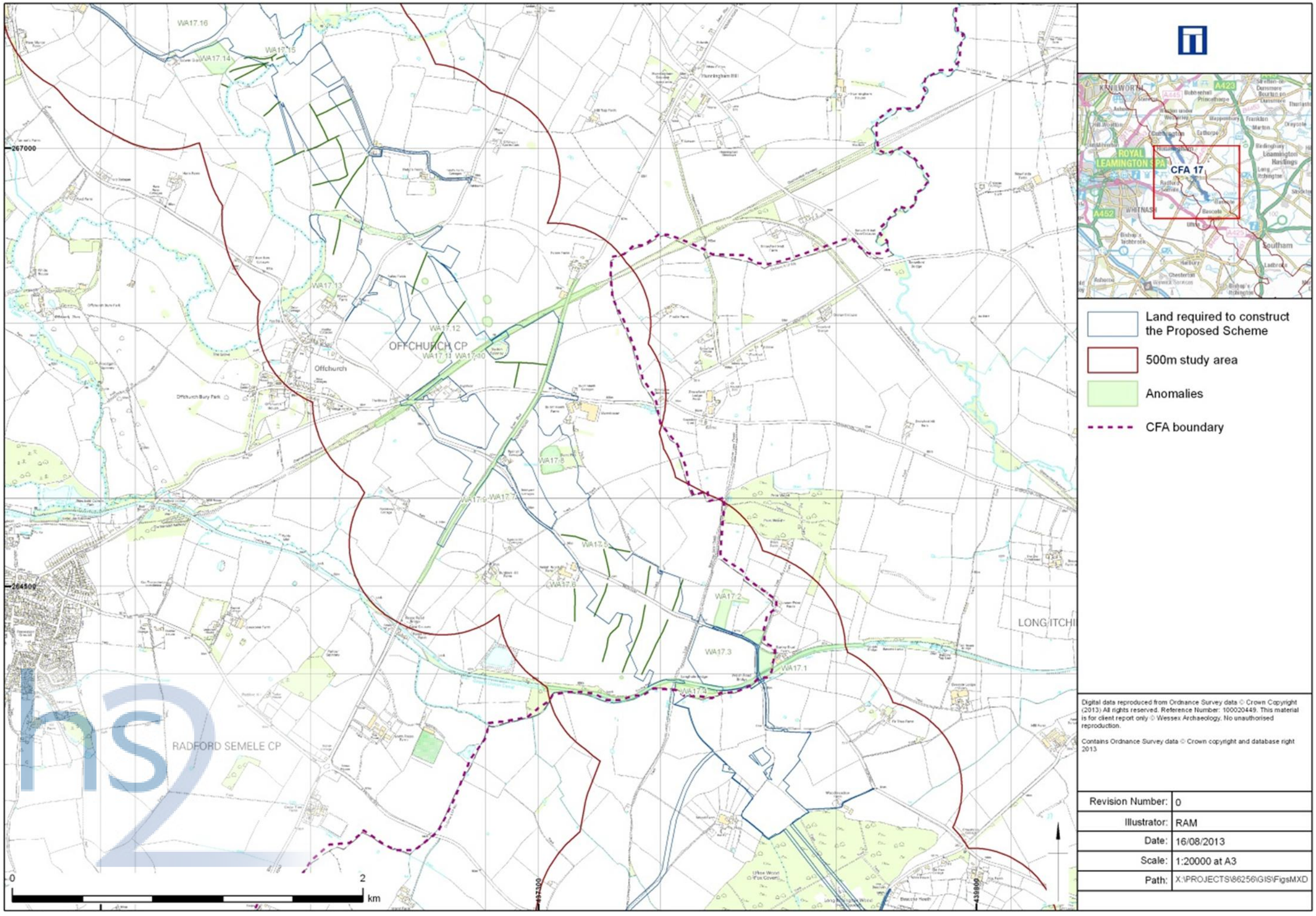

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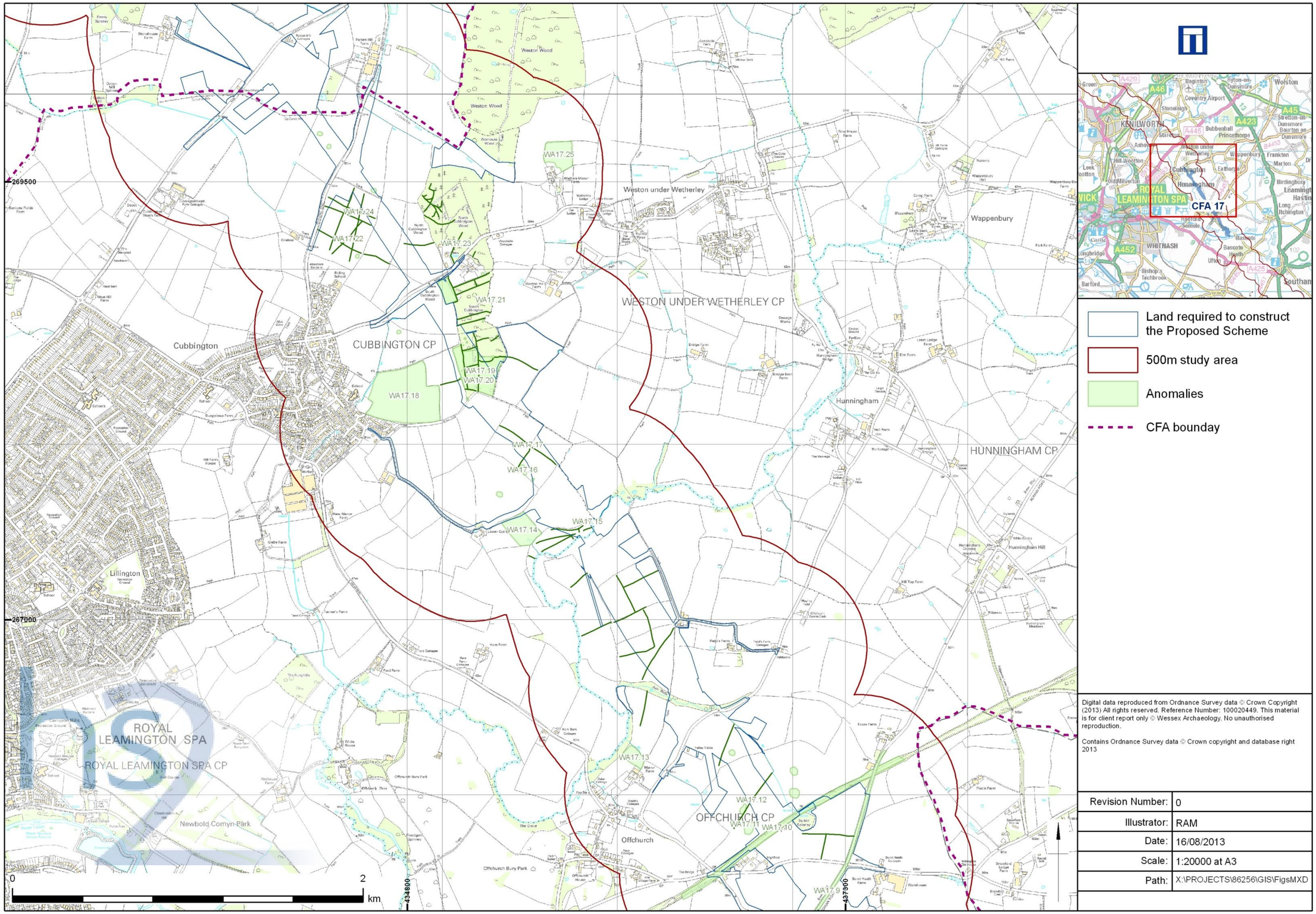
Figure 6: Anomalies within CFA17



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Date:	16/08/2013
Scale:	1:20000 at A3
Path:	X:\PROJECTS\86256\GIS\FigsMXD

2.7 Identified sites

Table 1: Sites within CFA17

No	Site	Eastings	Northings	Description	Date	Confidence rating
WA17.1	Grand Union Canal	438230	263930	Stretch of Grand Union Canal including one bridge, towpaths etc. Evident on both LiDAR and Hyperspectral plots	Post-medieval/ Modern	High
WA17.2	W and NW of Barley Stud Farm	438600	264100	Small areas of ridge and furrow surviving in the fields to the W and NW of Barley Stud Farm. Visible on Hyperspectral plots	Medieval/Post-medieval?	Moderate to high
WA17.3	W of Barley Stud Farm	438130	263835	2 ponds in the fields to the west of the Stud Farm. Visible on LiDAR plots	Post-medieval/ Modern	Moderate to high
WA17.4	W of Barley Stud Farm	438175	263895	Traces of ridge and furrow in woodland to south of the canal. May be plantation furrows, but look more like agricultural ridge and furrow. Visible on LiDAR plots	Medieval/Post-medieval?	Moderate to high
WA17.5	SE of Welsh Rd Farm	437865	264185	Linear earthworks representing former field boundaries in the fields to the SE of the farm. Visible on LiDAR plots	Post-medieval/ Modern	Moderate to high
WA17.6	Welsh Rd Farm	437440	264505	Pond immediately to the south of farm complex. Visible on LiDAR plots. Evident on both LiDAR and Hyperspectral plots	Post-medieval/ Modern	High
WA17.7	W of Brickyard cottages	437090	265000	Pond in woodland to W of cottages. Visible on LiDAR plots	Post-medieval/ Modern	Moderate to high
WA17.8	SW of Burnt Heath Farm	437375	265200	Large reservoir, irregular in plan. Evident on both LiDAR and Hyperspectral plots	Modern	High
WA17.9	Fosse Way	437210	265450	Roman road aligned NE-SW across the area. Extends beyond the LiDAR data available. Evident on both LiDAR and Hyperspectral plots	Roman	High
WA17.10	N of Fosse Way	436870	265785	Disused Railway line. Evident on both LiDAR and Hyperspectral plots	Modern	High
WA17.11	E of Manor Farm	436720	265915	Five hollows in fields to the E of Manor Farm. Possibly former quarries or ponds. Visible on LiDAR plots	Post-medieval/ Modern	Moderate
WA17.12	E of Manor Farm	437190	265775	A number of linear earthworks probably representing disused field boundaries. Visible on LiDAR plots	Post-medieval/ Modern	Moderate to high
WA17.13	N of Manor Farm	436100	266215	Field to the north of the farm shows clear traces of ridge and furrow. Visible on Hyperspectral plots	Medieval/Post-medieval?	Moderate to high
WA17.14	E of Lower Grange	435460	267500	Traces of ridge and furrow. Aligned both NW-SE and W-E. Evident on both LiDAR and Hyperspectral plots	Medieval/Post-medieval?	Moderate to high
WA17.15	E of Lower Grange	435730	267475	E of lower grange. Series of linear ditches, probably former boundaries or drainage features. Visible on LiDAR plots	Unknown	Moderate
WA17.16	NE of Lower Grange	435455	267860	Three hollows to the NE of Lower Grange. Possibly former quarries or ponds. Visible on LiDAR plots	Post-medieval/ Modern?	Moderate
WA17.17	NE of Lower Grange	435500	267980	Series of linear earthworks representing the remains of former field boundaries. Visible on LiDAR plots	Post-medieval/ Modern	Moderate to high
WA17.18	E of Cubbington	434750	238300	Very well defined ridge and furrow aligned NE-SW in fields E of Cubbington. Evident on both LiDAR and Hyperspectral plots	Medieval/Post-medieval?	High
WA17.19	South Cubbington Wood	435200	268415	Traces of ridge and furrow ploughing on both an N-S and E-W alignment evident within the southern end of the wood and in the NW corner. Visible on LiDAR plots.	Medieval/Post-medieval?	Moderate to high
WA17.20	South Cubbington Wood	435195	268455	Series of boundary ditches within woodland presumably representing former field boundaries or drainage features. Visible on LiDAR plots.	Medieval/Post-medieval?	Moderate to high
WA17.21	South Cubbington Wood	435280	268820	Series of hollows or ponds within the wood and on its edges, many fed by ditches. Visible on LiDAR plots.	Medieval/Post-medieval?	Moderate to high
WA17.22	NE of Cubbington	434515	269075	Six roughly circular hollows. Possibly former ponds or quarries.	Post-medieval/ Modern?	Moderate
WA17.23	North Cubbington Wood	434980	269355	Series of boundary ditches within woodland presumably representing former field boundaries or drainage features. There appears to be an enclosure at the northern end of the wood. . Visible on LiDAR plots.	Medieval/Post-medieval?	Moderate to high
WA17.24	NE of Cubbington	434520	269285	Series of linear earthworks representing the remains of former field boundaries	Post-medieval/ Modern	Moderate to high
WA17.25	N of Wethele Manor Farm	435660	269650	Ridge and furrow in the field to the north of the manor farm	Medieval/Post-medieval	Moderate to high